Ethics

May 30, 2018

Replace “Physics” with your science

- Each physicist is a citizen of the community of science.
- Each shares responsibility for the welfare of this community.
- Science is best advanced when there is mutual trust, based upon honest behavior, throughout the community.
- Acts of deception, or any other acts that deliberately compromise the advancement of science, are unacceptable.
- Honesty must be regarded as the cornerstone of ethics in science.
- Professional integrity in the formulation, conduct, and reporting of physics activities reflects not only on the reputations of individual physicists and their organizations, but also on the image and credibility of the physics profession as perceived by scientific colleagues, government and the public.
- It is important that the tradition of ethical behavior be carefully maintained and transmitted with enthusiasm to future generations.

https://www.aps.org/policy/statements/02_2.cfm

Our obligations as scientists

- Obligation to honor the trust that our colleagues place in us
- Obligation to ourselves
- Obligation to act in ways that serve the public

Important actions to understand

- Falsification
- Fabrication
- Plagiarism

What should you do?

Important concepts to understand

- Replication
- Reproducibility
- Generalizability

From the perspective of the Scientific Method

Basic Steps of the Scientific Method

- Observe
  - Bench scale experiments observe neurotransmitters are associated with depression
- Develop question ➔ Hypotheses
  - What if we alter these neurotransmitters, will it alleviate the symptoms of depression?
  - There is no difference in depression symptoms between the control group receiving the placebo and the treatment group receiving the new antidepressant drug
- Design an experiment (replicate)
  - Randomly select sample from target population (adults suffering from depression) and randomly assign them to receive a control (placebo) or treatment (new drug)
- Collect data (reproduce)
- Analyze the data (reproduce)
  - Exploratory and confirmatory data analysis and inferential modeling.
- Report conclusions (generalize) - Inferences extend to target group
- Back to the drawing board

In the Context of the Clinical Trial

- Generalizability refers to inferring from a sample to a target population - inductive reasoning - makes broad generalizations from specific observations (sample) to the target population
- Replication: can the entire process be replicated by the same or different lab under identical conditions
- Reproducibility: can the exact numerical results and inferences be reproduced by reanalyzing the same data
  - Would the person reanalyzing the data make the same decisions regarding outliers, transformations, modeling, analyses methods, etc. etc

What about In the context of a policy study

- What happens when complex policy interventions are cast as simple treatments and the scientific method is employed?
- The context in which the policy intervention takes place is the key to understanding when, how, for whom, and to what extent an intervention can be replicated and the results generalized.

Basic Steps in the Context of *ALL* Data

- Observe
  - Set social context for issue to be studied, articulate action space
- Develop question
  - Use literature and best practices help formulate and refine questions, hypotheses, define and shape data discovery process
- Design Experiment (replicate)
  - Data discovery process
- Collect data (reproduce)
  - Data acquisition approach, data sharing agreements, etc.
- Analyze the data (reproduce)
  - Disciplined approach to data repurposing, model development, and fitness-for-use assessments
- Report conclusions (generalize)
- Back to the drawing board